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ORIGINAL ARTICLE

Preoperative Embolization for Nasopharyngeal Angiofibroma: A Meta-Analysis of Blood Loss Reduction

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INTRODUCTION

Juvenile nasopharyngeal angiofibroma is a benign hypervascular tumor. Although histologically benign, they behave in a locally invasive manner having a propensity to thin and erode bone and displace adjacent structures. Accurate staging, preoperative embolization, and newer surgical approaches like endoscopic excision for limited stage disease and maxillary swing approach for advanced stage disease are associated with better surgical outcome.

Objective: To determine the preoperative mean blood loss during resection in patients undergoing preoperative embolization of nasopharyngeal angiofibroma.

Study Design: Descriptive cross-sectional survey

Setting: Post graduate Medical Institute/ Ameer ud Din Medical college/Department of diagnostic and interventional neuroradiology, Lahore General Hospital, Lahore.

Duration of study with dates: Study was carried out over a period of six months from 16-08- 2020to 15-02-2021.

Subjects and methods: A total of 30 patients were included in this study. Peroperative blood loss was measured during resection of nasopharyngeal angiofibroma after embolization (as per operational definitions).

Results: Mean age of the patients was 14.40±5.69 years. Out of 30 patients, 28 (93.3%) were males while only 2 patients (6.7%) were females. Size of tumour < 5 cm was found in 16 patients (53.3%) while >5 cm was seen in 14 patients (46.7%). Mean size of tumor was observed 5.50±2.28 and mean amount of per-operative bleeding was 596.67±204.23ml. Stratification with regard to age, gender, FNA size (cm) was also carried out.

Conclusion: In conclusion, pre-operative embolization reduces significantly the preoperative blood loss, minimizes the need of blood transfusion, and makes resection easier.

Keywords: Pre-surgical Embolization, Juvenile Nasopharyngeal angiofibroma, Blood loss

INTRODUCTION

Juvenile nasopharyngeal angiofibroma is a benign fibrovascular tumour affecting almost exclusively young adolescent boys, originating from the posterolateral wall of the nasal cavity [1].

It is locally aggressive and typically spreads anteriorly into the nasal cavity, inferiorly into the oropharynx, laterally through the sphenopalatine foramen into the infratemporal fossa and superiorly into the orbit via the infraorbital fissures. As the tumour grows, it may extend intracranially into the anterior and middle cranial fossa [2].

The aetiology of JNA is unknown. It might arise from the paraganglionic cells at the end of the maxillary artery; or it might follow the angiogenic and histogenetic theory according to which, the neoplasm is derived from a purely vascular proliferation of a haemangioma, while all other components, such as fibrous stroma, are derived from undifferentiated mesenchyme [3].

The incidence of JNA is 0.05% of all tumours of the head and neck region [4]. The incidence of JNA in South Asia appears to be greater than in the West [5].

The clinical manifestations of NJA is chronic epistaxis, nasal obstruction and hinorrhea. There is also conductive hearing loss from Eustachian-tube obstruction, liplopia due to erosion into the cranial cavity causing pressure on the optic chiasm. Rarely anosmia, recurrent otitis media and eye pain [6].

Diagnosis, in essence, is based on the history, clinical manifestations, endoscopic evaluation and imaging studies such as computed tomography (CT), magnetic resonance imaging (MRI) and angiography [7].

Angiography before treatment is indicated to defined the extent of the lesion, amount of vascularity and nature of feeding vessels. Intracranial extension of tumour presents additional hazards to surgery [8].

Embolization reduces the intra-operative blood loss at primary surgery from an average of 1510ml in the non-embolized patients to 510 ml in the embolized patients and transfusions from an average of 4.4 units to none [9]. According to local studies preoperative embolization reduces blood loss to 700 ml [10]. In a study average intraoperative blood loss is 567.7±422.25ml [11].

Preoperative embolization was first reported in the early 1970s and consistently correlated with marked reduction in surgical blood loss [12].

JNA was first described in conjunction with nasal polyps by Hippocrates in the 5th century BC [13], but it was Chelius who distinguished it as one associated with puberty in 1847. Initially regarded as a fibrous nasal polyp at that time, the term “angiofibroma” was not coinded uintil Friedberg did so in 1940 [14].

After embolization bleeding is minimized during surgery. It is ideally carried out few days before surgery. The feeding vessel to the tumour is identified. It is then deliberately occluded by means of materials injected through a selectively placed catheter. Immediate complications of embolization are pain, embolization of normal vessels and hypersensitivity. Delayed complications include fever, pain and infections.

MATERIAL AND METHODS

Study Design: Descriptive cross-sectional survey

Setting: Post graduate Medical Institute/ Ameer ud Din Medical college/Department of diagnostic and interventional neuroradiology, Lahore General Hospital, Lahore.

Duration of study with dates: Study was carried out over a period of six months from 16-08- 2020to 15-02-2021.

Sample size: The calculated sample size is 30 cases using 95% confidence level d=0.25 with an expected mean blood loss as 567.7±422.25 ml [11] patients undergoing pre-operative embolization of nasopharyngeal angiofibroma.

Sampling technique: Non-probability consecutive purposive sampling.

Sample selection: Inclusion Criteria

- All the cases of nasopharyngeal angiofibroma where embolization and surgery is possible (as per operational definitions).
- Age 5-25 years

- Both genders

Exclusion Criteria

- Where tumor is getting blood supply from internal carotid artery beyond petrous portion of ICA or venous drainage of bigger caliber into sinuses assessed on DSA.

Data collection procedure: All patients presenting with clinical suspicion of NFA referred by ENT department of Lahore general Hospital and other hospitals of Lahore meeting the inclusion criteria were taken. Informed consent for procedure in the DS from all the patients included in the study was taken. All the patients were recorded for their demographic features i.e. age and gender. All procedures were performed by senior interventional radiologist in angiography suite on a biplane flat panel DSA unit (Artis-ZEE angiography machine Seimen's corporation) in the neuroradiology department of Lahore general Hospital, Lahore. Procedures were carried out under local anaesthesia via femoral artery approach. Initially diagnostic cerebral antiography was carried out in all patients using a 6 Fr headhunter catheter (Cordis corporation) to define the vascular anatomy, site of NFA and status of collateral circulation. Branch of external carotid artery supplying NFA was engaged supra selectively and embolization was performed using spongostone. Post-procedure angiography was performed to evaluate the success of procedure. Performa regarding preoperative blood loss after embolization is attached herewith. Peroperative blood loss was measured during resection of nasopharyngeal angiofibroma after embolization (as per operational definitions).

Data analysis: All the data was analyzed with SPSS version 23. For quantitative data like age and per-operative blood loss mean and standard deviation was calculated. For qualitative data i.e. gender, was presented in the form of frequency and percentages. Data was stratified for age, gender, size of NFA to address the effect modifiers. Post-stratification t-test was applied to check the significance with p value < 0.05 as significant.

RESULTS

Patients ranged between 5-25 years of age. 19 patients (63.3%) were 5-15 years old and 11 patients (36.7%) were 16-25 years of age (Table-1).Out of 30 patients, 28 (93.3%) were males while only 2 patients (6.7%) were females (.Size of tumour < 5 cm was found in 16 patients (53.3%) while >5 cm was seen in 14 patients (46.7%) (Table-1). Mean size of tumor was observed 5.50±2.28, mean age of the patients was 14.40±5.69 years, and mean amount of per-operative bleeding was 596.67±204.23ml (Table-3).

Stratification with regard to age, gender, FNA size (cm) was also carried out and presented in Tables 3.

Table-1: Distribution of cases by Age, Gender & Size of tumor

Age (Year)	Number	Percentage
05-15	19	63.3
16-25	11	36.7
Total	30	100.0
Gender		
Male	28	93.3
Female	02	06.7
Total	30	100.0
Size of tumor (cm)	Number	Percentage
< 5	16	53.3
> 5	14	46.7
Total	30	100.0

Table-2: Mean values of size of NFA, age and amount of per-operative bleeding (ml)

Variables	Mean	S.D
Size of NFA (cm)	5.50	2.28
Age (Year)	14.40	5.69
Amount of per-operative bleeding (mL)	596.67	204.23

Table-3: Stratification with regard to Age, Gender & FNA size (cm)

Age	Amount of per-operative bleeding (mL)		P value
	Mean	SD	
05-15	578.95	241.12	0.47
16-25	627.27	121.16	
Gender			
Male	596.43	209.90	0.97
Female	600.00	141.42	
FNA size (cm)			
< 5	578.12	187.94	0.61
> 5	617.86	226.68	

DISCUSSION

The juvenile nasopharyngeal angiofibroma is, as the name suggests, a disease of young men.6 In the present study, all patients were male, and the mean age at the time of diagnosis was 16.8 years, which is similar to other published studies [4,6,9].

Genetic studies have demonstrated a close relation between these angiomas and androgen receptor expression, suggesting that this tumor is androgen-dependent. This could explain why the prevalence is higher in males [1,6,8].

In most cases, the clinical presentation of the angiofibroma comprises the triad nose block, epistaxis, and a nasopharyngeal mass, which was similar to our findings in the study and in previously published papers [14].

The diagnosis of angiofibroma is given based on the clinical history, the physical examination, and nasal endoscopy; imaging studies, such as computed tomography, may add further information, as was done in the patients comprising this study. The correlation between preoperative staging based on computed tomography and the Fisch criteria [15] was possible in the 16 cases of this study. Computed tomography makes it possible to stage tumors correctly, and may demonstrate the presence and extension of recurrences during follow-up [2,7].

All patients underwent surgery, which is the most effective therapy for angiofibromas. There is no consensus on which surgical procedure is best; the most frequently used approach today is the transmaxillary route, which allows better exposure of the tumor, lower morbidity, and no facial scars [7,4].

Some studies have reported that better control of surgical bleeding has been associated with improved support for surgery, such as embolization done 24 to 48 hous preoperatively, updated surgical techniques, and professional experience. Embolization may significantly decrease intraoperative bleeding by reducing tumor size, thereby facilitating its removal. As a result, there are low recurrence rates following preoperative embolization. Embolization of the maxillary artery is a relatively safe invasive procedure; a complication of this procedure is embolism into the intracranial circulation, but this event is rare [2,5,6].

In present study, amount of mean per-operative bleeding was 596.67±204.23 ml which is comparable with a study carried out by Gemmete et al [11] demonstrated mean blood loss 537.7±422.25 ml. While another study has reported that embolization made no difference in blood loss and that the average blood loss for all 24 patients in that study was 1784 ml [7]. A more recent study reported seven patients having 10 procedures without embolization (mean blood loss 5380 ml) and 13 patients having 16 procedures with embolization (mean blood loss 1037.5 ml), yet the difference in blood loss was only significant when comparing high grade tumors [9]. Another study with 43 cases reported that morbidity, recurrence and intraoperative complications decreased with embolization and skull based surgical approaches, which further supports the use of embolization prior to surgery.

CONCLUSION

In conclusion, pre-operative embolization reduces significantly the preoperative blood loss, minimizes the need of blood transfusion, and makes resection easier.Preoperative angiographic evaluation

and embolization of JNA are important tools for planning surgical approach.

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